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Name: Electrical gas discharge tube

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Electrical gas discharge tube

The invention relates to electrical gas discharge tubes with at least one activated electrode, and especially to low-pressure, mercury vapor discharge tubes.

As is known, in gas discharge tubes with activated electrodes the phenomenon arises that the activating material disappears from the electrodes during operation. The activating material can be released from the electrode for example by ion and/or electron impact which takes place during discharge, or it can vaporize as a result of the high operating temperature of the electrode. The released and vaporized material can move among others under the influence of the electrical discharge through the discharge tube and reach other points on which it precipitates, for example the wires with which the electrode in the tube is supported and supplied. These wires, hereinafter called the "current feed wires", are melted into one part of the wall. This wall part can have different forms; one of the most common forms is that of the pinch which is known in discharge tube engineering. Most gas discharge tubes, for example low-pressure mercury vapor discharge lamps, have at least one such pinch. But embodiments of gas discharge tubes are known in which the current feed wires are melted into a flat wall part.

The electrodes of the gas discharge lamps are very hot in operation. Some of this heat is always supplied via the current

feed wires to the melt-in point; furthermore the melt-in point is heated by radiation from the electrode. The melt-in point is thus exposed to a highly increased temperature and must be resistant to it. Under this thermal load it may not have for example any cracks or chemical changes and may not deform. Generally the current feed wires are relatively thin and relatively long (measured from the melt-in point to the electrode). Heat conduction in most cases is therefore not so great that the melt-in point is endangered when the discharge attacks the electrode. But the situation changes completely, if after a number of hours in operation some of the emitting material has been precipitated onto the current feed wires. Then the discharge can also easily attack the current feed wires instead of the actual electrode. In this way the heat conduction distance to the melt-in point becomes much shorter and the melt-in point can also be heated by radiation above the ordinary temperature. Of course this defect is especially telling in highly loaded lamps in which the current intensity is large and thus vaporization of the emitting material is greater, while in addition when the current feed wires are attacked heating is also extraordinarily great as a result of the higher current intensity. Especially for these highly loaded lamps thus cracks can easily form in the melt-in point which can even lead to complete fracture. The discharge tube accordingly becomes leaky and can no longer be used.

The object of the invention is to counteract the heating of the melt-in point.

An electric gas discharge tube as claimed in the invention has at least one activated electrode with at least one current feed element melted into one part of the glass wall of the discharge tube and is characterized in that between the electrode and this wall part there is a disk-shaped ceramic body which is provided with one or more through-holes for the current feed elements and which at the sites of the through-holes has a thickness such that at least one quarter of the length of the current feed element, measured between the electrode and the melt-in part in the wall, is located in a through-hole in the ceramic disk.

The ceramic disk causes a reduction of the heating of the melt-in point as a result of radiation. The disk for example has a circular cross section in a plane parallel to the electrode.

Because at least one fourth of the length of the current feed element is in the ceramic disk, the emitting material which vaporizes off the cathode cannot be deposited on this part of the current feed wire. The discharge can thus no longer attack the current feed wire at this point; this results in a much lower temperature of the melt-in point of the current feed wire.

It is especially advantageous if the ceramic disk at the point at which the current feed wires are melted into the wall rests on this wall. Then specifically there is no danger that between the ceramic layer and the melt-in part still emitting material will be precipitated on the current feed element.

When the current feed elements are melted into a pinch which projects within the discharge tube, it is especially advantageous

if the ceramic disk on the side of the pinch has a vertical edge which at least partially surrounds the pinch. In particular, in this case also a major improvement of the insulation of the melt-in point against the thermal radiation originating from the cathode and from the discharge is obtained.

It is known that it is favorable in highly loaded gas discharge lamps, especially low-pressure, mercury vapor discharge lamps, to locate at the level of the activated electrode a plate-shaped element which is not electrically connected to the electrode. As a result of the presence of one such plate which preferably has the shape of a ring which surrounds the cathode, the blackening of the wall of the discharge tube is greatly reduced in the vicinity of the electrodes. It has been found from the studies which led to the invention that especially in these lamps, cracks of the melt-in point, for example of the pinch, occur. The use of a ceramic disk is therefore of special importance for a conventional type of lamp.

The for example annular plate which is not connected to the electrode must of course be supported. This generally takes place by a support element being attached to the plate-shaped element and in the vicinity of the melt-in point of the current feed elements being melted likewise into the wall, especially into the pinch. Also because then the melt-in points of the current feed wires and of the support element are near one another do cracks occur when the wall becomes too hot at this point.

The support element of the plate-shaped electrode is preferably routed through a hole of the ceramic disk. The support element of the plate-shaped electrode can then be used to hold the ceramic disk by this element being kinked. The ceramic disk is then enclosed for example between the pinch and the kink in the support element. In discharge tubes without a supporting element a kink can be made in the current feed wires themselves.

The thickness of the ceramic disk need not be the same everywhere, but for example can be smaller next to the through hole.

The invention is detailed below using the attached drawings which represent some embodiments of discharge tubes as claimed in the invention in sketches and in part in section.

Figure 1 shows one embodiment with a flat ceramic disk and a pinch;

Figure 2 shows one embodiment with a ceramic disk with a vertical edge and a pinch, and

Figure 3 shows one embodiment with a flat ceramic disk in a discharge tube without a pinch.

In Figure 1 a part of the wall of the low-pressure mercury vapor discharge lamp is labelled 1. This part is connected on one side to a glass pinch 2 into which the current feed wires 3 and 4 are melted for the activated cathode 5. The ceramic wafer 6 consists for example of porcelain and in it there are through-holes 7 and 8. In these through-holes 7 and 8 are parts of the current feed wires 3 and 4 of the cathode 5. The ceramic disk 6, as the Figure shows, rests on the pinch 2. On the parts of the

current feed wires located in the through holes 7 and 8 almost no emitting material of the cathode can be precipitated since the through holes are narrow. The disk 6 furthermore shields the pinch against thermal radiation of the cathode 5 and the discharge.

In Figure 2 a part of the wall of a low-pressure, mercury vapor discharge lamp is labelled 11. This part of the wall ends in the pinch 12 into which the current feed wires 13 and 14 are melted for the activated cathode 15. A ceramic disk consisting for example of porcelain is labelled 16. This ceramic disk 16 is provided with a vertical edge 17 which surrounds part of the pinch. In this way better shielding of the feed wires against emitting material is obtained than with a flat disk as shown in Figure 1. The narrow through-holes in the ceramic disk 16 for the current feed wires are labelled 18 and 19. An annular electrode which is not connected to the cathode is labelled 20. This annular electrode is fixed using the kinked support wires 21 which have been melted into the pinch 12. The ceramic disk is held by the kink in the support wire 21.

In Figure 3 a part of the wall of the discharge tube as claimed in the invention is labelled 31. This wall 31 ends in a flat bottom 32 in which the current feed wire 33 for the cathode 34 is located. This cathode is of the type which is not preheated and is heated by the discharge current. A ceramic disk is labelled 35 in which a narrow through-hole 36 for the current feed wire 33 is located. The disk 35 rests almost completely on the glass bottom 32. The disk is thicker at the site of the

through hole 36 than on the edge. The thickest part surrounds more than one fourth of the current feed wire 33 between the melt-in point and the cathode 34.

Claims

1. Electrical gas discharge tube with at least one activated electrode with at least one current feed element melted into one part of the glass wall of the discharge tube, characterized in that between the electrode and this wall part there is a disk-shaped ceramic body which is provided with one or more through-holes for the current feed elements and which at the site of the through-holes has a thickness such that at least one quarter of the length of the current feed element, measured between the electrode and the melt-in point in the wall, is located in a through-hole in the ceramic disk.

2. Electrical gas discharge tube as claimed in claim 1, wherein the ceramic disk at the point at which the current feed element is melted into the wall rests on this wall.

3. Electrical gas discharge tube as claimed in claim 1 or 2, in which the wall part into which the current feed elements are melted has the shape of a pinch which projects within the discharge tube, wherein the ceramic disk on the side of the pinch has a vertical edge which at least partially surrounds the pinch.

4. Electrical gas discharge tube as claimed in claim 1, 2, or 3, wherein at the level of the activated electrode there is a plate-shaped element which is not electrically connected to the electrode and is supported by a support element which is melted into the same wall part as the current feed elements of the electrode and is routed likewise through a through-hole in the ceramic disk.

5. Electrical gas discharge tube as claimed in claim 1, 2, 3, or 4, wherein the ceramic disk is held by a kink in one or more of the current feed elements and/or the support elements.